UiT

NORGES
ARKTISKE
UNIVERSITET

How many dental implant systems are on the market?

What is their scientific documentation?

Slido

slido.com Code: UofT_GradPros

https://jokstad.net/Implants.pdf

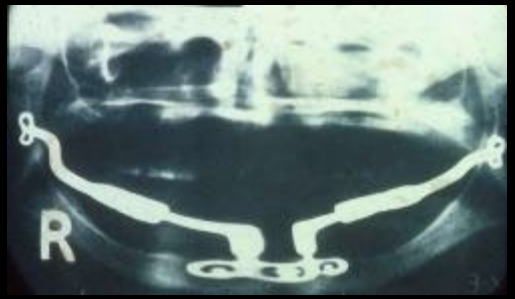
Asbjørn Jokstad

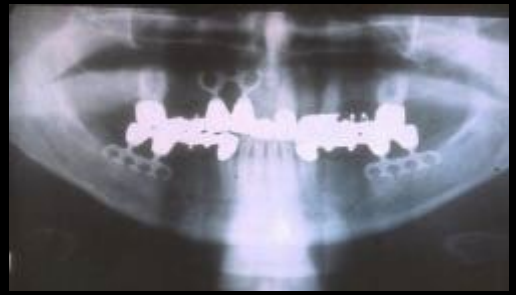
asbjorn.jokstad@uit.no

Questions regarding dental implants

1. How many manufacturers and brands?
2. How many published clinical studies can be labelled as scientific?
3. How many manufacturers and brands have been documented in scientific clinical studies?

Dental implants - status in 1979

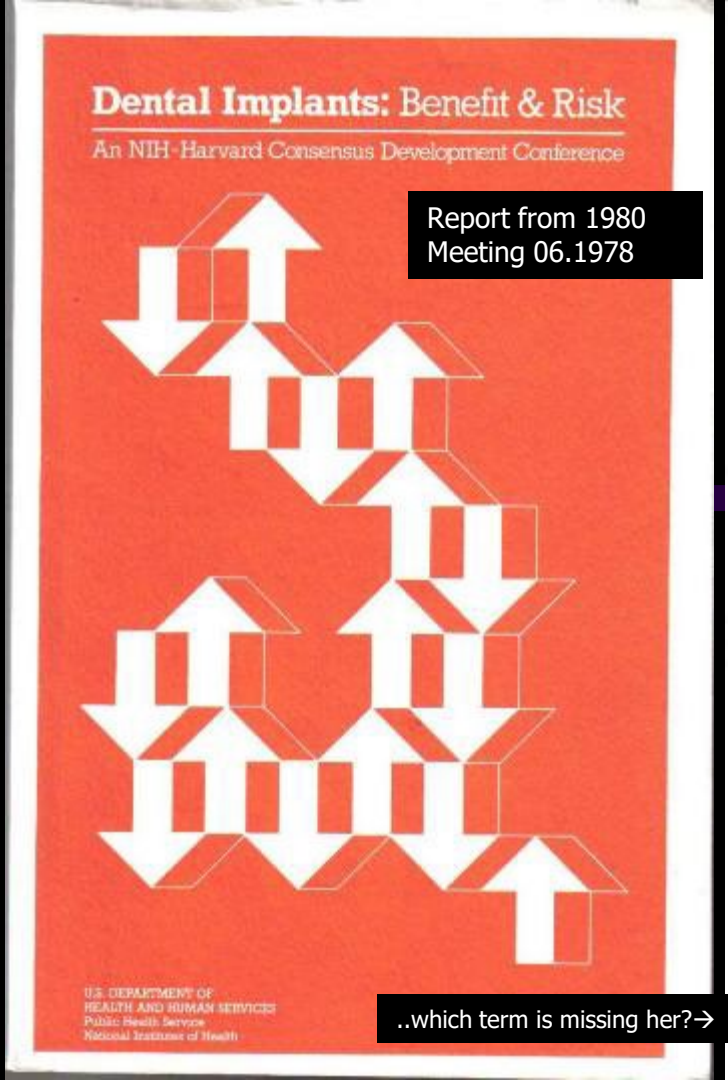




A subperiosteal implant (cobalt-chromium) – lost wax casting technique

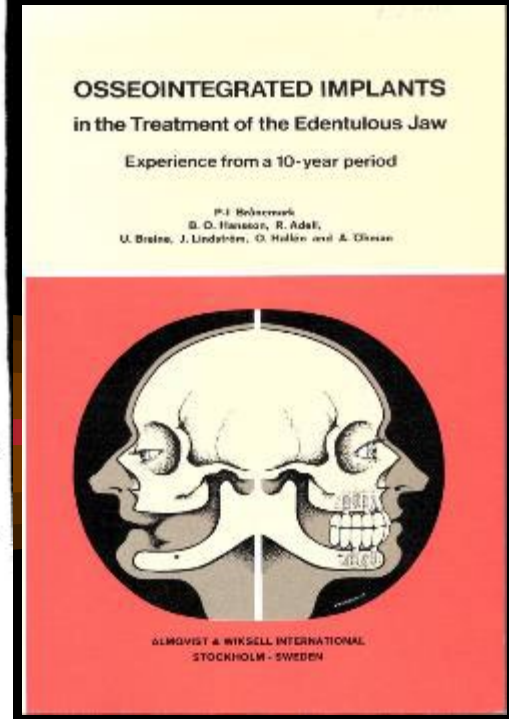
Scientific journals

1. Oral Implantology (1954 → J Oral Implantology (1971)
2. Revista Brasileira de Implantodontia (1969)



Report from 1980 Meeting 06.1978

..which term is missing her?→



Brånemark et al. Intra-osseous anchorage of dental prostheses. I. Experimental studies. *Scand J Plast Reconstr Surg* 1969;3:81-100.

The race for commercial dominance

Authors	Title	Source	product
Haraldson T, Carlsson GE	Bite force and oral function in patients with osseointegrated oral implants.	Scand J Dent Res. 1977; 85: 200-208	(Avesta JernVerk)Xenodent
Hansson BO	Success and failure of osseointegrated implants in the edentulous jaw	Swed Dent J. 1977; Suppl 1	(Avesta JernVerk)Xenodent
Brånemark PI, Hansson BO, Adell R, et al	Osseointegrated implants in the treatment of the edentulous jaw. Experience from a 10-year period	Scand J Plast Reconstr Surg. 1977; Suppl 16 (also: Almqvist Wiksell Int)	(Avesta JernVerk)Xenodent
Spiekermann H	Enossale implantate bei Totalersatz im Unterkiefer	Dtsch Zahnärztl Z. 1978; 33: 473	(Friedrichsfeld)IMZ-cylinder
Ledermann PD	Stegprothetische Versorgung des zahnlosen Unterkiefers mit Hilfe von plasmabeschichteten Titanischraubenimplanten	Dtsch Zahnärztl Z. 1979; 34: 907-911	(Ledermann)TPS-Screw, AKA (Straumann)TPS Swiss Screw
Haraldson T, Ingervall B	Muscle function during chewing and swallowing in patients with osseointegrated oral implant bridges.	Acta Odontol Scand. 1979; 37: 207-216	(Avesta JernVerk)Xenodent
Haraldson T, Carlsson GE, Ingervall B	Functional state, bite force and postural muscle activity in patients with osseointegrated oral implant bridges.	Acta Odontol Scand. 1979; 37: 195-206	(Avesta JernVerk)Xenodent
Haraldson T, Carlsson GE	Chewing efficiency in patients with osseointegrated oral implant bridges	Swed Dent J. 1979; 3: 183-191	(Avesta JernVerk)Xenodent
Ledermann PD	Die plasmabeschichtete Titanschraube als enossales implantat. Methodic der Implantaten und der postoperative Versorgung	Dtsch Zahnärztl Z. 1980; 35: 577-579	(Ledermann)TPS-Screw, AKA Straumann)TPS Swiss Screw
Breine U, Brånemark PI	Reconstruction of alveolar jaw bone. An experimental and clinical study of immediate and preformed autologous bone grafts in combination with osseointegrated implants	Scand J Plast Reconstr Surg. 1980; 14: 23-48	(Avesta JernVerk)Xenodent
Adell R, Lekholm U, Rockler B, Brånemark PI	A 15-year study of osseointegrated implants in the treatment of the edentulous jaw	Int J Oral Maxillofac Surg. 1981; 10: 387-416	(Avesta JernVerk)Xenodent
Albrektsson T, Brånemark PI, Hansson HA, et al.	Osseointegrated titanium implants. Requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man.	Acta Orthop Scand. 1981; 52: 155-170	(Nobelpharma)Experimental ("Biotes")
Ledermann PD, Schroeder A	Klinische Erfahrungen mit dem ITI-Hohlzylinder-implantat	Schweiz Monatsschr Zahnheilkd. 1981; 91: 349-367	(Straumann)ITI hollow cylinder

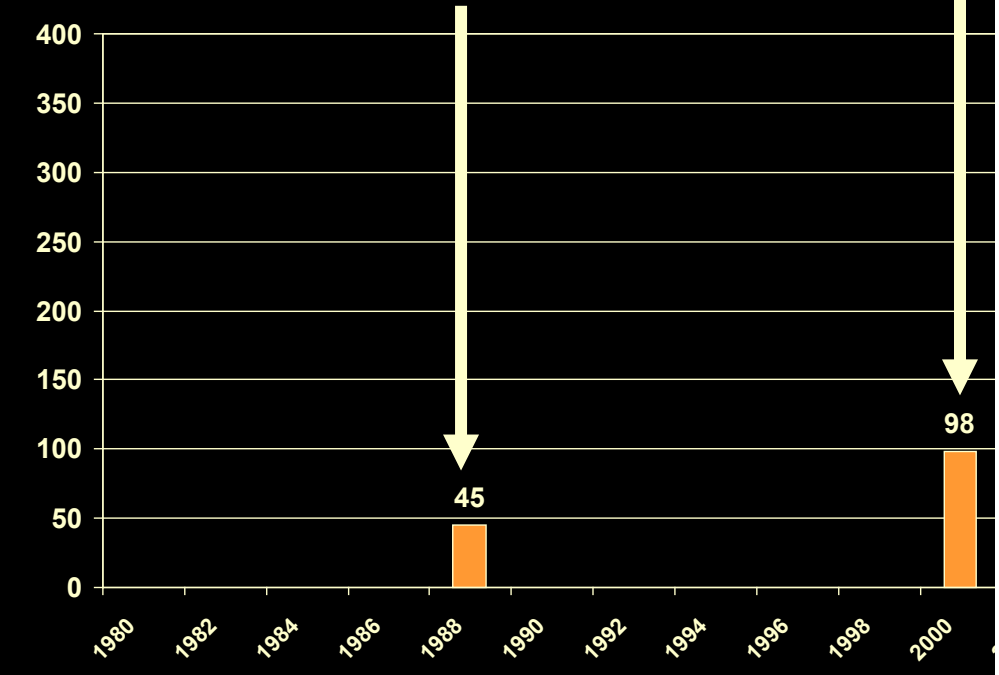
Osseointegration in Clinical Dentistry. Conference, Toronto, May 1982

1. One implant manufacturer – ~~Bofors~~ Nobelpharma: *Biotes*
2. One implant design - screw
3. One implant metal - c.p. 1 Titanium
4. One implant surface treatment - machined
5. One indication - an edentulous lower jaw
6. One surgical procedure - two-stage & minimum 4-6 months healing
7. One supra-construction on 4-6 "fixtures" splinted across the midline

Summary: J Prosthet Dent 1983 49(6) & 50(1)(2)(3) + Brånemark et al. Textbook. Quintessence. 1985.

Binon PP. Implants and components: entering the new millennium.
Int J Oral Maxillofac Implants. 2000;15:76-94.

English CE. Implants. An overview.
CDA J. 1988;16: 34-8.



REVIEW ARTICLE

Implants and Components: Entering the New Millennium

Paul P. Binon, DDS, MSD[1]

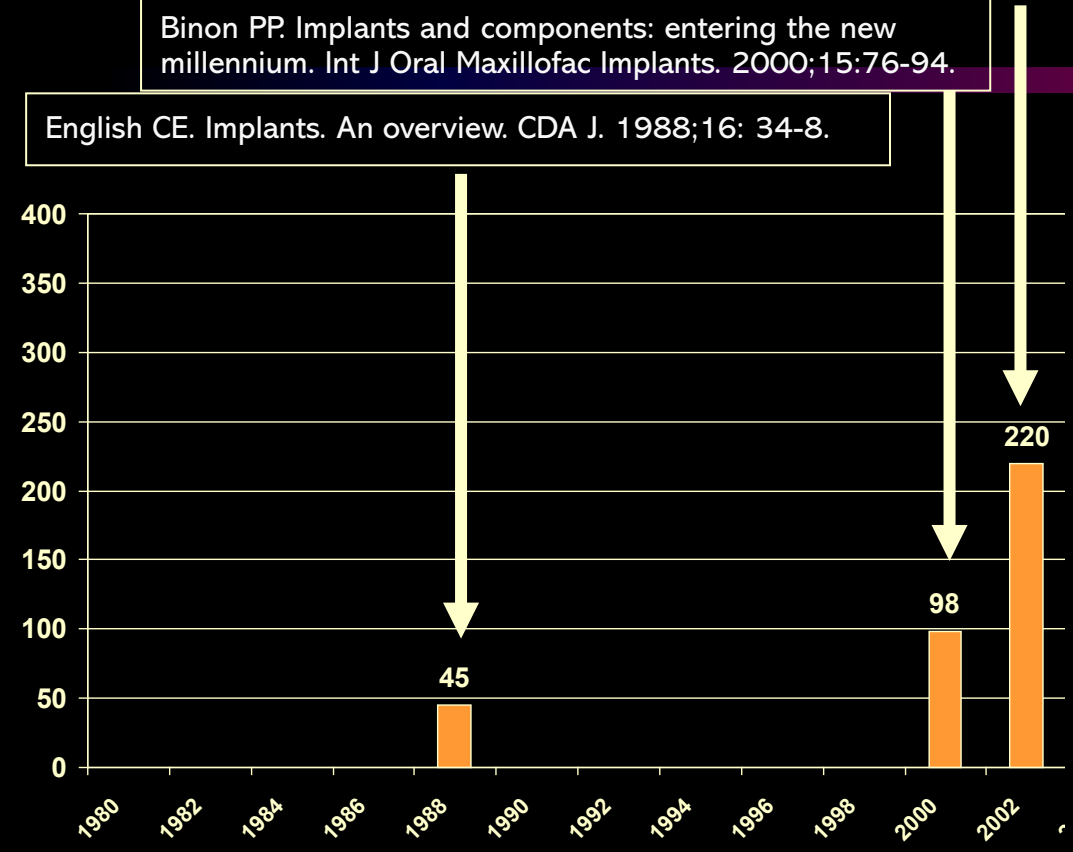
The elusive dream of replacing missing teeth with artificial analogs has been part of dentistry for a thousand years. The coincidental discovery by Dr P-I Brånemark and his coworkers of the tenacious affinity between living bone and titanium oxides, termed *osseointegration*, propelled dentistry into a new age of reconstructive dentistry.

Initially, the essential tenets for obtaining osseointegration dictated the atraumatic placement of a titanium screw into viable bone and a prolonged undisturbed, submerged healing period. By definition, this required a 2-stage surgical procedure. To comply, a coupling mechanism for implant placement and the eventual attachment of a transmucosal extension for restoration was explored. The initial coronal design selected was a 0.7-mm-tall external hexagon. At its inception, the design made perfect sense, because it permitted engagement of a torque transfer coupling device (fixture mount) during the replacement, maxillofacial and a myriad of other applications, limited only by the ingenuity and skill of the clinician.[11–13] The external hexagonal design, ad modum Brånemark, originally intended as a coupling and rotational torque transfer mechanism, consequently evolved by necessity into a prosthetic indexing and antirotational mechanism.[14,15] The expanded utilization of the hexagonal resulted in a number of significant clinical complications.[8–11,16–22] To mitigate these problems, the external hexagonal, its transmucosal connections, and their retaining screws have undergone a number of modifications.[23] In 1992, English published an overview of the then-available external hexagonal implants, numbering 25 different implants, all having the standard Brånemark hex configuration.[14] The external hex has since been modified and is now available in heights of 0.7, 0.9, 1.0, and 1.2 mm and with flat-to-flat widths of 2.0, 2.4, 2.7, 3.0, 3.3, and 3.4 mm,

Jokstad et al. Quality of dental implants. Int Dent J. 2003;53(6 Suppl 2):409-43

Binon PP. Implants and components: entering the new millennium. Int J Oral Maxillofac Implants. 2000;15:76-94.

English CE. Implants. An overview. CDA J. 1988;16: 34-8.



Asbjørn Jokstad, Oslo, Norway
Urs Braegger, Bern, Switzerland
John B. Brunski, Troy, USA
Alan B. Carr, Rochester, USA
Ignace Naert, Leuven, Belgium
Ann Wennerberg, Gothenburg, Sweden

#Dental implant manufacturers and brands in 2025 – where to find this information?

source	web
FDA 510(k)Databases	fda.report
Implant Register	implant-register.com
International Medical Device Database	medicalexpo.com
Osseosource	osseosource.com
Spotimplant	spotimplant.com
U.K. Medicines & Healthcare products Regulatory Agency	more.mhra.gov.uk/login
What implant is that?	whatimplantisthat.com/
Which Implant?	which-implant.com
ZWP Zahnarzt Wirtschaft Praxis	zwp-online.info

Best source to answer how many dental implant manufacturers and brands?

#Dental implant manufacturers and brands in 2025 – where to find this information?

source	web	Responses:
FDA 510(k)Databases	fda.report	9%
Implant Register	implant-register.com	0
International Medical Device Database	medicalexpo.com	55%
Osseosource	osseosource.com	0
Spotimplant	spotimplant.com	0 (Right answer)
U.K. Medicines & Healthcare products Regulatory Agency	more.mhra.gov.uk/login	0
What implant is that?	whatimplantisthat.com/	36%
Which Implant?	which-implant.com	0
ZWP Zahnarzt Wirtschaft Praxis	zwp-online.info	0

How many dental implant manufacturers? Suggest a number.

Right answer: 788

Top ten countries:

- Germany – 140
- Italy – 100
- USA – 95
- Israel – 44
- France – 38
- Switzerland – 38
- Brazil – 35
- Spain – 30
- Argentina – 27
- Korea – 65

Producer	country
"O" Company ----------> 2005 OCO Biomedical Inc. (name change)	USA, NM
µ-One ----------> 2019 Discontinued	Japan
3d Alpha Biomedical Srl ----------> 2017 Discontinued	Italy
3i Implant Innovations ----------> 1999 Biomet 3i --> Zimvie	USA, FL
3M ESPE Dental Products <---------- 2008 Sendax	USA
3M ESPE Dental Products ----------> 2016 Condent	USA, MN
3P Implafavourite®	Italy
A.A.D. Dental GmbH / MGM Implant	Germany
A.S. Technology Componentes Especiais Ltda. /AKA TitaniumFix	Brazil
AB Dental Devices Ltd.	Israel
ACE Surgical Supply® / Infinity System	USA, MA
Aceriboni	Italy
ACH Medical Co., Ltd. <---------- 2014 Biogenesis	Korea
Adaptare Sistema de Implantate ----------> ? Discontinued	Brazil
ADIN Dental Implants Systems Ltd..	Israel
ADT Dental®	Germany
Advan Srl	Italy
Advance Com®	Syria
Agliati Srl (OEM)	Italy
AGS medikal	Turkey
AIDI Biomedical®	USA, CA
Aiser	Switzerland
Alfa-Gate®	Israel / Germany Holdin
All-Guide®	Korea
Allhex Implants System®	France
Alliance Global Technology	Taiwan
Allmed Srl	Italy
Alloden	Korea

How many different dental implant brands? Suggest a number.

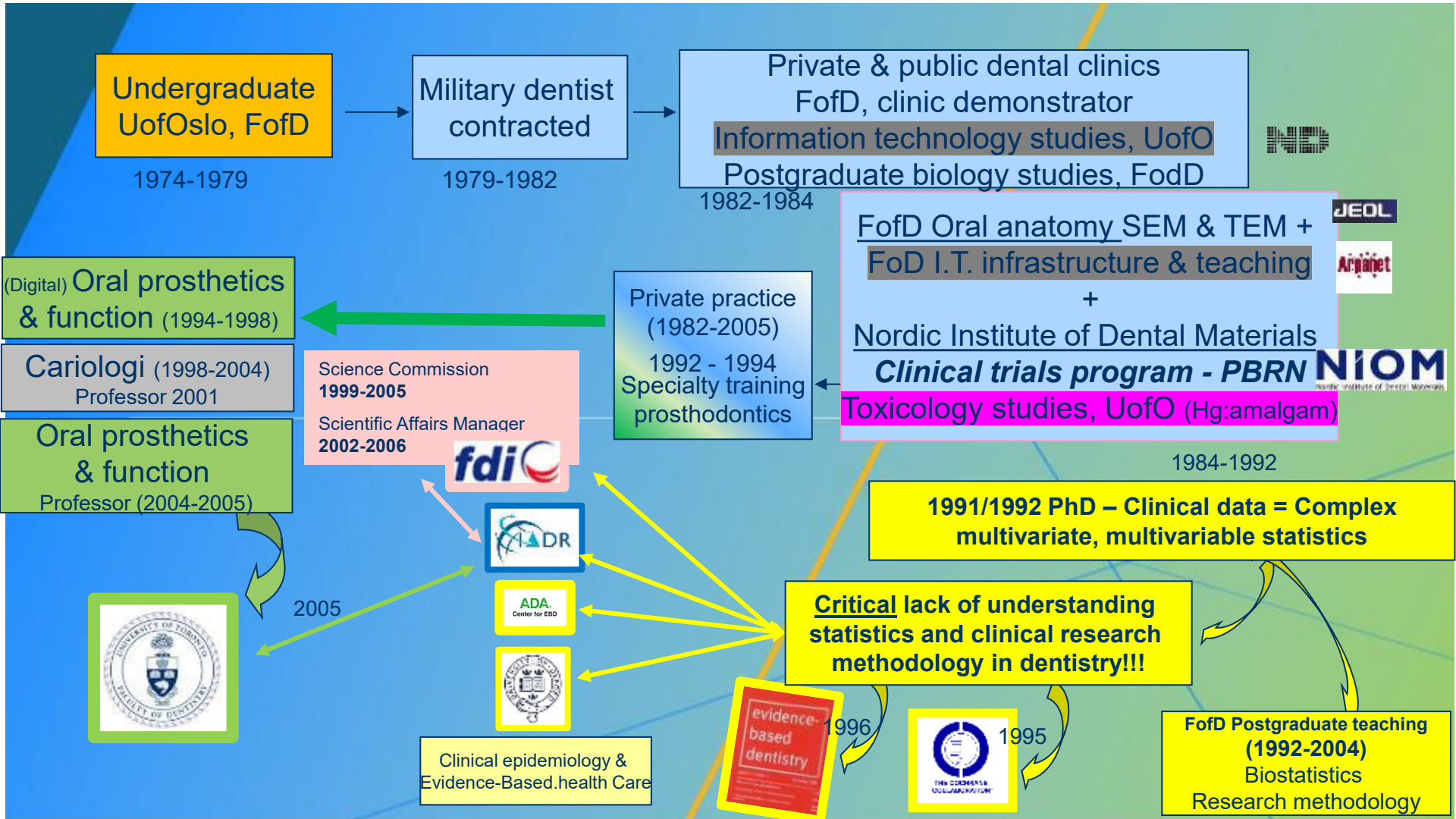
Right answer:

~3700

Implant	Producer
2.0 Well	I-System by Novodent SA
2.5 Well	I-System by Novodent SA
2.9	Leone®S.p.a.
3.0 Well	I-System by Novodent SA
Active	Alpha Dent Implants GmbH
Active Conus	Alpha Dent Implants GmbH
Advance CC®	Kinetical S.R.L. / Biounite
Advance HI®	Kinetical S.R.L. / Biounite
Advance XS®	Kinetical S.R.L. / Biounite
Advanced	Bio 3™Implants GmbH
Aesthetica+2	etk / EuroTeknika Lyra ETK
Alvim CM Aqua®	Neodent®
Alvim CM NeoPoros	Neodent®
Anatomic CE	Tree-Oss®Odontotecnoempren
Anatomic CI	Tree-Oss®Odontotecnoempren
Anatomic CI PS	Tree-Oss®Odontotecnoempren
Anatomic IH	Tree-Oss®Odontotecnoempren
AnyOne®Internal Regular Thread	Megagen Implant Co., Ltd.
AnyOne®Internal Special Length	Megagen Implant Co., Ltd.
Anyridge®Internal Core	Megagen Implant Co., Ltd.
Anyridge®Internal Core 4.0	Megagen Implant Co., Ltd.
Apolonia Submerged	CSM Implants Co., Ltd.
AR®	Conexão Sistemas De Prótese
Arcsys®	FGM Produtos Odontologicos
avantgard	GMI Dental Implantology S.L.

Questions related to dental implants

1. How many manufacturers and brands?
2. How many published clinical studies can be labelled as scientific?
3. How many manufacturers and brands have been documented in scientific clinical studies?


Undergraduate
UofOslo, FofD
1974-1979
Military dentist
contracted
1979-1982
Private & public dental clinics
FofD, clinic demonstrator
Information technology studies, UofO
Postgraduate biology studies, FodD
1982-1984
FofD Oral anatomy SEM & TEM +
FoD I.T. infrastructure & teaching
+
Nordic Institute of Dental Materials
Clinical trials program - PBRN
Toxicology studies, UofO (Hg:amalgam)
1984-1992
(Digital) Oral prosthetics
& function (1994-1998)
Private practice
(1982-2005)
1992 - 1994
Specialty training
prosthodontics
Cariologi (1998-2004)
Professor 2001
Science Commission
1999-2005
Scientific Affairs Manager
2002-2006
Oral prosthetics
& function
Professor (2004-2005)
2005
1991/1992 PhD – Clinical data = Complex
multivariate, multivariable statistics
Critical lack of understanding
statistics and clinical research
methodology in dentistry!!!
Clinical epidemiology &
Evidence-Based.health Care
1996
1995
FofD Postgraduate teaching
(1992-2004)
Biostatistics
Research methodology

Interventions for replacing missing teeth with or without osseointegrated implants [protocol]

Reviewer(s)	Esposito M, Coulthard P, Worthington HV, Thomsen P
Contribution of Reviewer(s)	Paul Coulthard - data collection, assessment and analysis and final review Marco Esposito - data collection, assessment and analysis and final review Asbjorn Jokstad - data collection, assessment and analysis and final review Helen Worthington - statistical analysis and final review Peter Thomson - final review
Issue protocol first published	2000 Issue 3
Date of most recent amendment	30 August 2000
Date of most recent	09 February 2000

This protocol should b … ns for replacing missing teeth with or without o … *Library*, Issue 1, 2001.

Background

Missing teeth and suppo … itting restoration of masticatory, phonetic fu … out over 10 years showing that bone will g … v well-accepted concept, termed osseoi … ughs in dentistry over the past 20 years. A multitu … ich osseointegrated implant retained prosthe …

IJOMI 2001; 16: 783-92

Quality Assessment of Randomized Controlled Trials of Oral Implants

Marco Esposito, DDS, PhD[1]/Paul Coulthard, BDS, MFGDP, MDS, FDSRCS, PhD[2]/
Helen V. Worthington, BSc, MSc, PhD, FIS[3]/Asbjørn Jokstad, DDS, PhD[4]

The aim of this study was to assess the quality of randomized controlled trials (RCTs) concerned with the effectiveness of oral implants and to create a trial register. A multilayered search strategy was used to identify all RCTs published by the end of 1999 in any language. The Cochrane Oral Health Group specialist register, PubMed, and personal libraries were searched. Seventy-four RCTs were identified. Forty-three articles, not presenting the same patient material, were independently assessed by 3 researchers using a specially designed form. A statistician assessed all trials for the appropriateness of statistics. The quality of each study was assessed on 7 items, including 3 key domains. Randomization and concealment allocation procedures were not described in 30 articles (70%). Reasons for withdrawals were not given in 10 reports (23%). No attempt at blinding was reported in 31 studies (72%). The quality of RCTs of oral implants is generally poor and needs to be improved. (Int J Oral Maxillofac Implants 2001;16:783–792)

The quality of RCTs of oral implants is generally poor and needs to be improved

Commercially available implant and implant systems in October 2003:

225 implant brands

78 manufacturers

~70 implant brands disappeared

Is the approval process for placing new products on the market flawed?

World-Renowned Scholar Joins U of T's Faculty of Dentistry

2005

The long-standing relationship between the University of Toronto and Nobel Biocare has brought Professor Asbjørn Jokstad from the University of Oslo, Norway, to join U of T's Faculty of Dentistry as the Nobel Biocare Chair in Prosthodontics. The Chair, created in 2004 through a $2-million gift from the Swedish based company, promotes significant contributions to prosthodontic scholarship.

The prestige associated with the Nobel Biocare Chair allowed the Faculty to attract interest from international scholars of the highest calibre to the position, resulting in Jokstad's recruitment. U of T is the only Canadian university with endowed chairs in dentistry, and the Faculty's three such positions attest to its pervasive commitment to research and teaching excellence.

"Dr. Jokstad is among the most highly regarded academic prosthodontists in the world," says Professor David W. Dean of Dentistry. "He is devoted to improving the scientific basis for clinical research and teaching in dentistry. His skill in evidence-based dentistry and applying electronic tools to dental education is a welcome addition to our already world-class faculty."

Jokstad replaces the Chair's inaugural holder, retiring Professor George Zarb, North America's foremost expert in implant dentistry. Zarb's research and innovative teaching programs for Canadian dental faculty members initially brought Professor Per-Ingvar Brånemark, the founder of Nobel Biocare and inventor of modern dental implants, to work with U of T in the early 1980s.

"We need to partner with universities because we need the dental profession to tell us what patients need," says Heliana Canepa, president and CEO of Nobel Biocare. "We provide and the dental profession, as the experts, decides. Together we are strong!"

Left to right: David Wright (Dentist), University of Toronto, Asbjørn Jokstad, David Mock, Sorbet, Heliana Canepa

Swiss holding company
Hostile takeover.
2001 New CEO (Heliana Canepa)
2002 Swiss stock exchange
|
|
2007.5 MGM Arena, Las Vegas
2007.8 CEO replaced
2008.9 Global market crash
<u>All clinical research funding stopped until further</u>

1978 Biotes
1979 Brånemark standard (turned surface)
1984 Brånemark Conical (turned)
1986 Brånemark Ebon (turned)
1990 Brånemark self-tapping - (turned)
1994 Brånemark Mk II self-tapping - (turned)
1996 Brånemark Mk III - (turned)
~~1997 Replace +/- HA~~
1998 Replace Select Tapered
1998 Replace Select Straight
~~1999 Brånemark Mk IV - (turned)~~
1999 Brånemark NOVUM
2000 Tiunite (anodic oxidate) surface
2000 NobelSpeedy
2003 NobelPerfect
2004 NobelDirect
2005 "Shorty" implant
2005 NobelReplace
2005 "Groovy" implant

1983 FDA approval
1989 1st profit
1994 Patent Fraud
1998 Steri-Oss acquired
2006 Adverse outcome reports
2008 Sweden MPA warning
2010 Class action suit, CA, USA

2006
Nobel Biocare World Tour
Beautiful Teeth Now™

APR 19 2005

K050258

1.4 510(k) Summary of Safety and Effectiveness

Submitted by:	Herbert Crane Manager, Regulatory Affairs
Address:	Nobel Biocare USA LLC 22715 Savi Ranch Parkway Yorba Linda, CA 92887
Telephone:	(714) 282-4800, ext. 7830
Facsimile:	(714) 282-9023
Date of Submission:	February 2, 2005
Classification Name:	Endosseous Implant (21 CFR 872.3640)
Trade or Proprietary or Model Name:	Groovy Implants
Legally Marketed Device(s):	Nobel Biocare Endosseous Implants (K041661)

2.Feb 2005:
510K Application

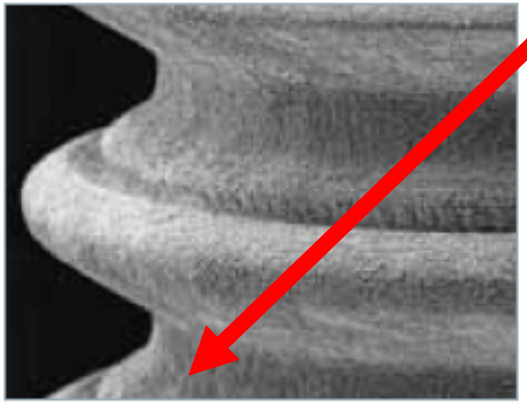
57 in vivo publications on TiUnite® prove its remarkable ability to interact with the biological environment. It is this unique characteristic that produces a stronger anchorage of the implant in the surrounding bone and a significantly faster rate of osseointegration. Additionally, clinical experience indicates that TiUnite® helps achieve firm Soft Tissue Integration™, which is a prerequisite for long-term soft-tissue esthetics.

Feeling Groovy

In 2005, Nobel Biocare took the complete range of TiUnite® implants to a new level of effectiveness with the introduction of the Groovy™ technology. As a further step towards shorter healing times and safer implant treatment, Nobel Biocare added a groove of optimal dimensions to the thread of the implants. The combined effect of TiUnite® and the groove is a favorable environment that stimulates faster bone growth within and along the groove. The result is not only further enhancement of the rate of osseointegration, but also up to 30 percent higher implant stability due to increased mechanical interlock between the bone and the implant.

Benefits of Grooves Incorporated onto the Thread of the Implant:

- Up to 30 percent higher stability
- Enhanced osseoconductive properties leading to higher biomechanical stability
- Bone forms more rapidly along the grooves compared to the rest of the implant
- Particularly effective in soft bone



> GROOVY IMPLANT
The groove at the thread takes the TiUnite® implants to a new level of effectiveness.

> GROOVY BONE FORMATION
Faster bone growth within the groove results in enhanced rate of osseointegration and biomechanical stability.

The "Groovy implant"

30%

Page 33. In: Nobel Biocare. *Annual report* 2005

Indications for Use:

Nobel Biocare's Groovy Implants are root-form endosseous implants intended to be surgically placed in the bone of the upper or lower jaw arches to provide support for prosthetic devices, such as an artificial tooth, in order to restore patient esthetics and chewing function. Nobel Biocare's Groovy Implants are indicated for single or multiple unit restorations in splinted or non-splinted applications. Nobel Biocare Groovy Implants may be placed immediately and put into immediate function providing that the initial stability requirements detailed in the surgical manuals are satisfied.

Groovy implants are indicated for use in soft bone in posterior regions or whenever immediate or early loading is applied. The Groovy implants incorporate a groove on the implant thread and are preferred over models without the groove in these soft bone indications because bone forms more rapidly in the groove than on other parts of the implant resulting in increased stability when compared to non-grooved implants.

…bone forms more rapidly in the groove than on other parts of the implant resulting in increased stability when compared to non-grooved implants.

Purpose: *Study if bone formation and implant stability were influenced by 110 μm and 200 μm and 70 μm deep grooves positioned at a thread flank*

M&M: 18 rabbits – 6 x 7 mm implants

9: 3 control impl. + 3 test impl. (110 μm wide & 70μm deep)

9: 3 control impl. + 3 test impl. (200 μm wide & 70μm deep)

6 weeks → Removal torque (RTQ) (2 control vs 2 test → Histology (1 control impl. vs 1 test impl.) "bone-fill"

Results:	RTQ	% bonefill	
110x70 μm grooves	+30% $p < 0.05$ (36)	$p < 0.05$ (18)	vs. control
200x70 μm grooves	+ 8% $p < 0.05$ (36)	$p < 0.05$ (18)	vs. control

Conclusion: *The 110 micron-wide groove was shown to increase the resistance to shear forces significantly. It is suggested that implants with such a groove may be one way to optimize implant stability in suboptimal clinical conditions."*

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
9200 Corporate Boulevard
Rockville MD 20850

Nobel Biocare AB
C/O Mr. Herbert Crane
Manager, Regulatory Affairs
Nobel Biocare USA, LLC
22715 Savi Ranch Parkway
Yorba Linda, California 92887

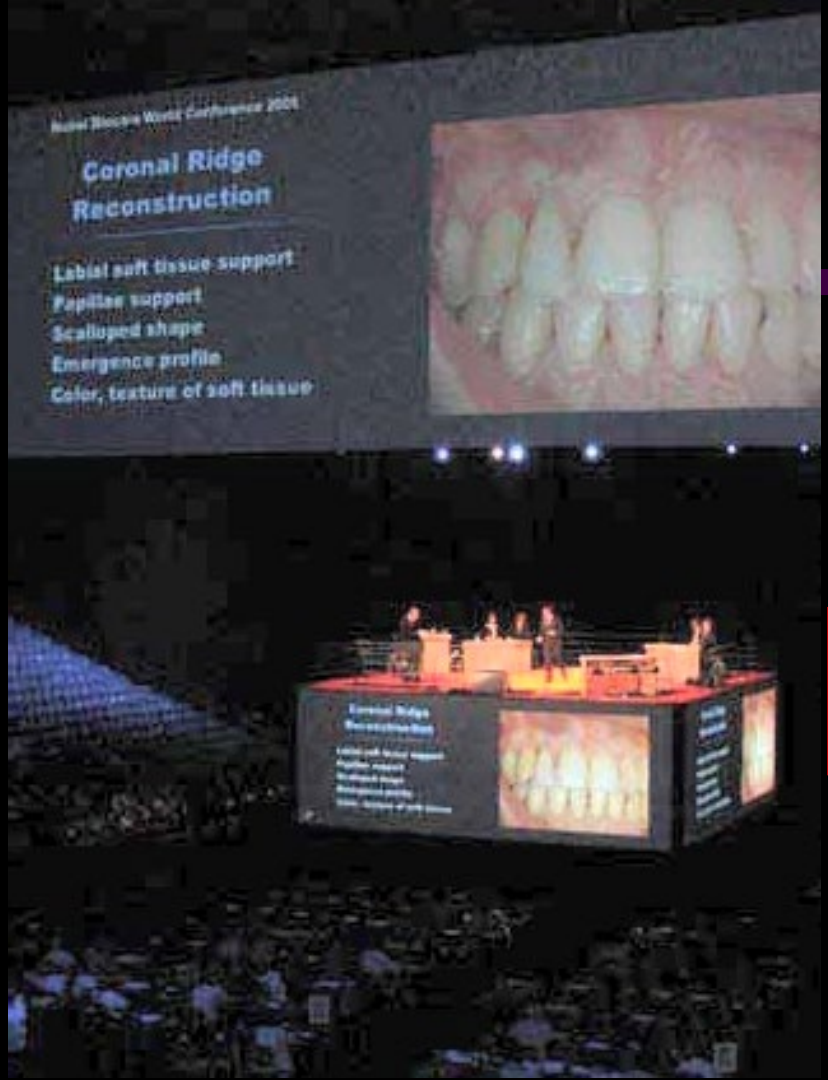
APR 19 2005

Re: K050258
Trade/Device Name: Groovy Implants
Regulation Number: 21 CFR 872.3640
Regulation Name: Endosseous Implant
Regulatory Class: II
Product Code: DZE
Dated: February 2, 2005
Received: February 3, 2005

Dear Mr. Crane:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

19. April 2005:
510K Approval !



2 Feb 2005: Application

19 April 2005: Approval

6 June 2005: World Premiere!

MGM Arena, Las Vegas

APR 19 2005

K050258

1.4 510(k) Summary of Safety and Effectiveness

Submitted by:	Herbert Crane Manager, Regulatory Affairs
Address:	Nobel Biocare USA LLC 22715 Savi Ranch Parkway Yorba Linda, CA 92887
Telephone:	(714) 282-4800, ext. 7830
Facsimile:	(714) 282-9023
Date of Submission:	February 2, 2005
Classification Name:	Endosseous Implant (21 CFR 872.3640)
Trade or Proprietary or Model Name:	Groovy Implants
Legally Marketed Device(s):	Nobel Biocare Endosseous Implants (K041661)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
9200 Corporate Boulevard
Rockville MD 20850

Nobel Biocare AB
C/O Mr. Herbert Crane
Manager, Regulatory Affairs
Nobel Biocare USA, LLC
22715 Savi Ranch Parkway
Yorba Linda, California 92887

APR 19 2005

Re: K050258
Trade/Device Name: Groovy Implants
Regulation Number: 21 CFR 872.3640
Regulation Name: Endosseous Implant
Regulatory Class: II
Product Code: DZE
Dated: February 2, 2005
Received: February 3, 2005

Dear Mr. Crane:

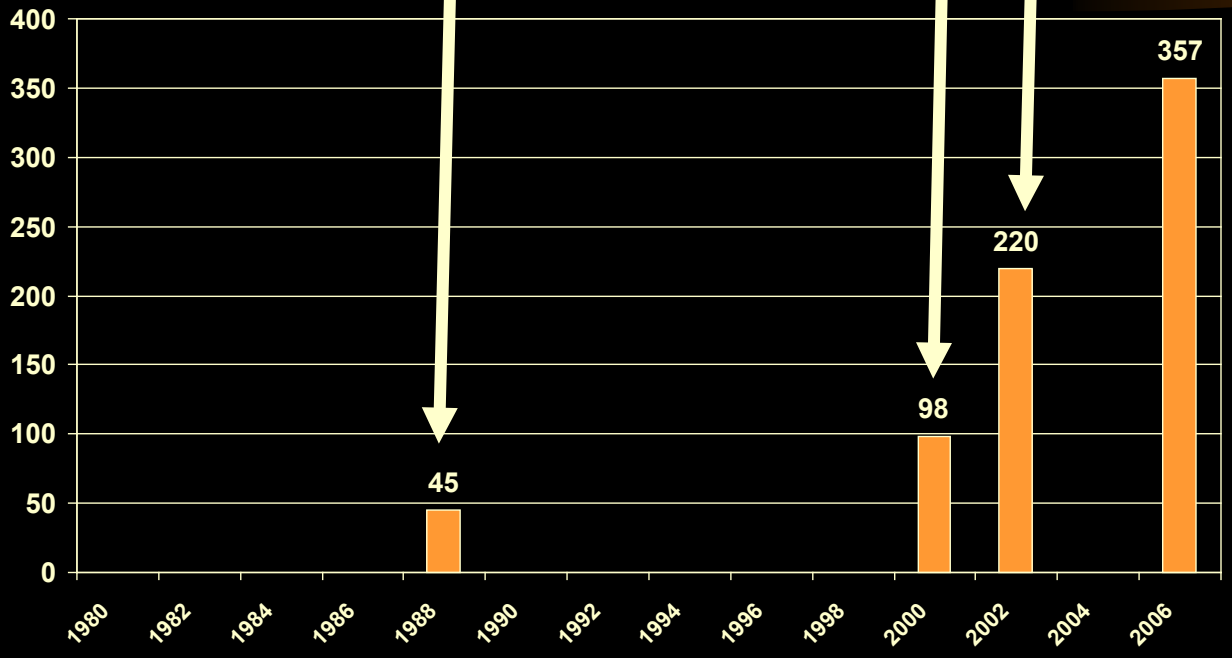
We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general

hm, is a FDA 510(k) approval too easy to get?

Jokstad et al. Quality of dental implants. Int Dent J. 2003;53(6 Suppl 2):409-43

Binon PP. Implants and components: entering the new millennium. Int J Oral Maxillofac Implants. 2000;15:76-94.

English CE. Implants. An overview. CDA J. 1988;16: 34-8.



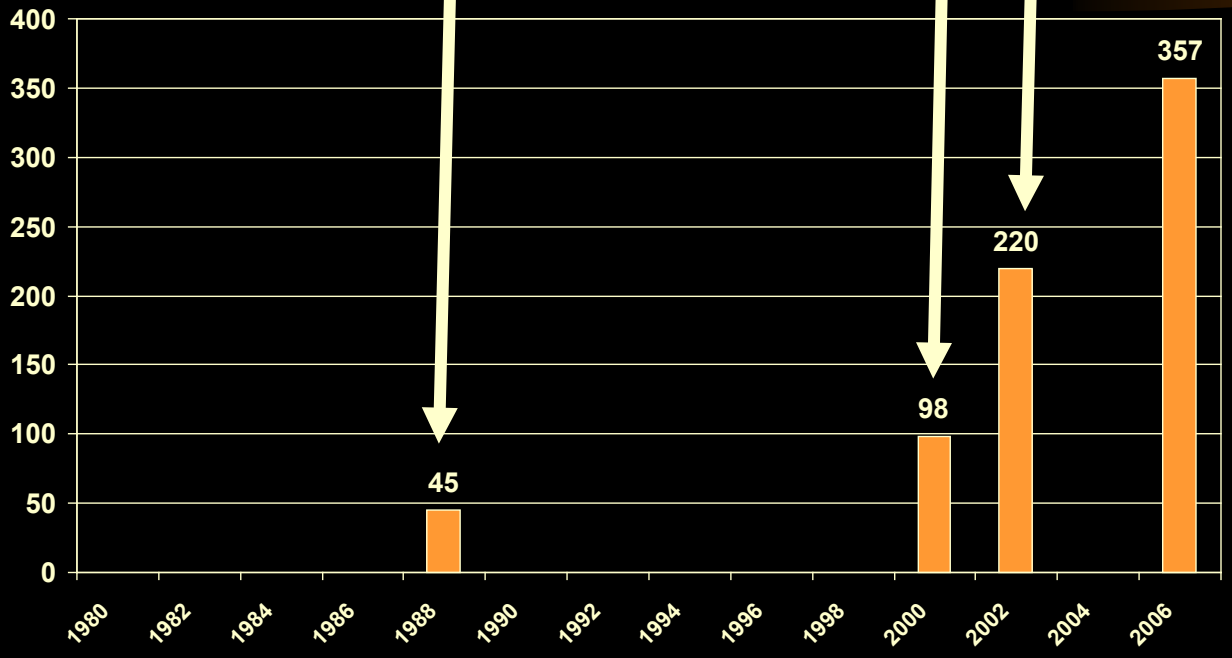
AMERICAN COLLEGE OF PROSTHODONTISTS

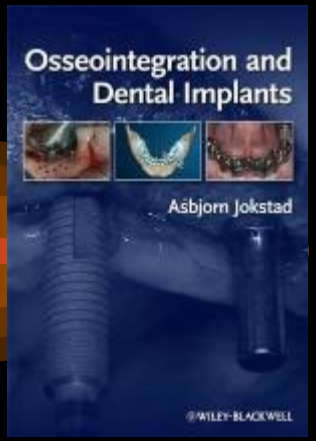
May 2006
San Francisco

Jokstad et al. Quality of dental implants. Int Dent J. 2003;53(6 Suppl 2):409-43

Binon PP. Implants and components: entering the new millennium. Int J Oral Maxillofac Implants. 2000;15:76-94.

English CE. Implants. An overview. CDA J. 1988;16: 34-8.

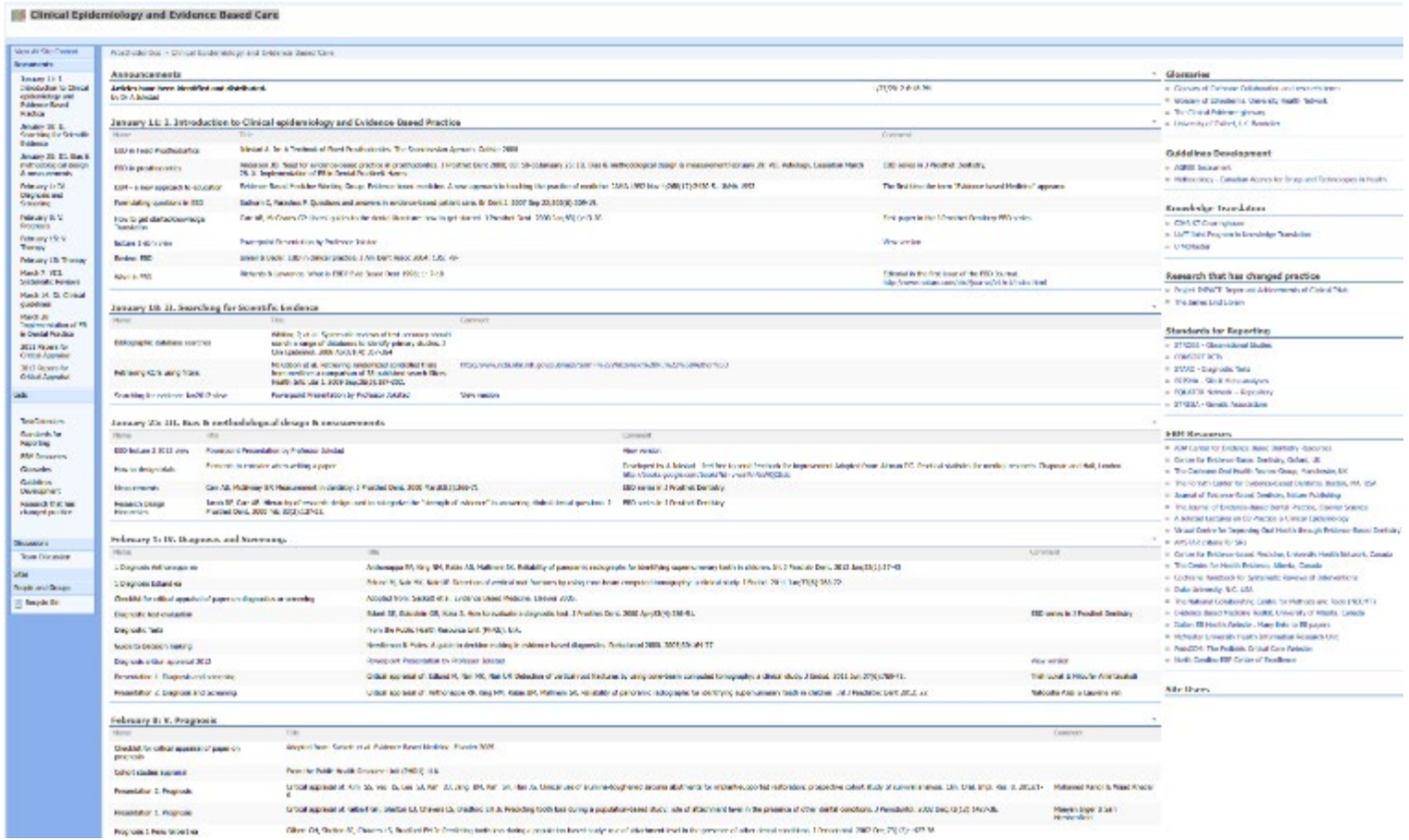




2008
Jokstad et al. How Many Implant Systems Do We Have and Are They Documented? Chapter 1.
ISBN: 978-0-813-81341-7

SGS University of Toronto DEN 1014 Clinical Epidemiology Requirement

..how to interpret the clinical science correctly



Received: 5 January 2022 | Revised: 7 March 2022 | Accepted: 5 April 2022

SYSTEMATIC REVIEW

Journal of Clinical Periodontology WILEY

...ervation or au... ...plant placem... ...measures ... ...us with or prior ...w of outcomes ...the last 10 years

...Eduardo Mo... ...Sanz-Sánc... David Palombo[6]

...School ...

[2]Colle... ...anghai Jiao Tong University ... China

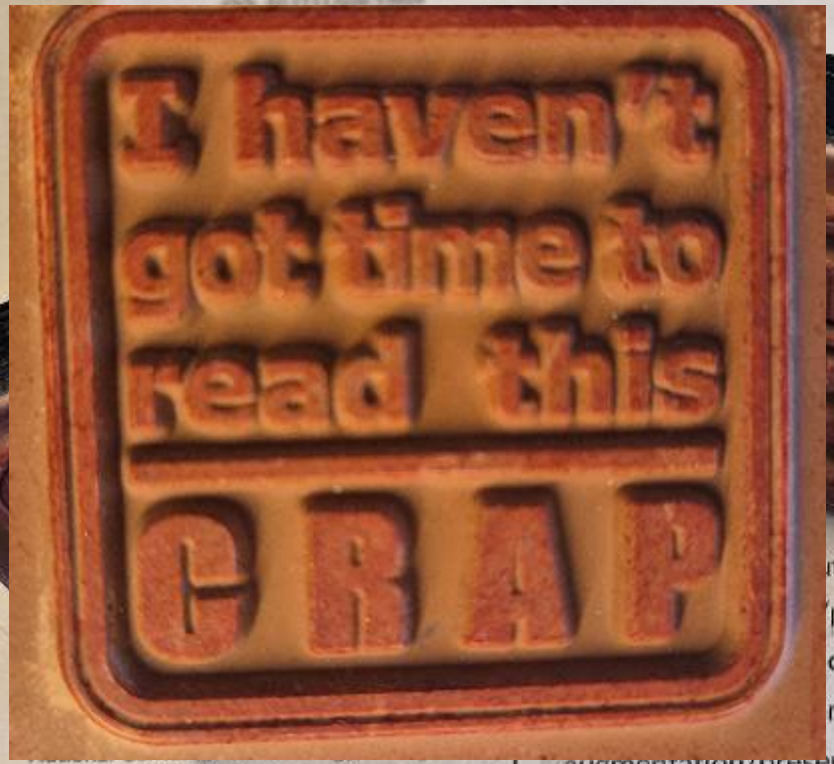
[3]National Center for Stomatology, Shanghai, China

[4]National Clinical Research Center for Oral

Abstract

Aim: To evaluate outcome measures and methods of assessment in clinical studies on bone augmentation/preservation procedures for the placement of dental implants.

Materials and Methods: A systematic search was performed on three databases from January 2011 to April 2021 to identify clinical studies reporting on any type of bone augmentation/preservation procedure. The outcomes that have been used to assess efficacy or performance in each study were registered and assigned to different



China

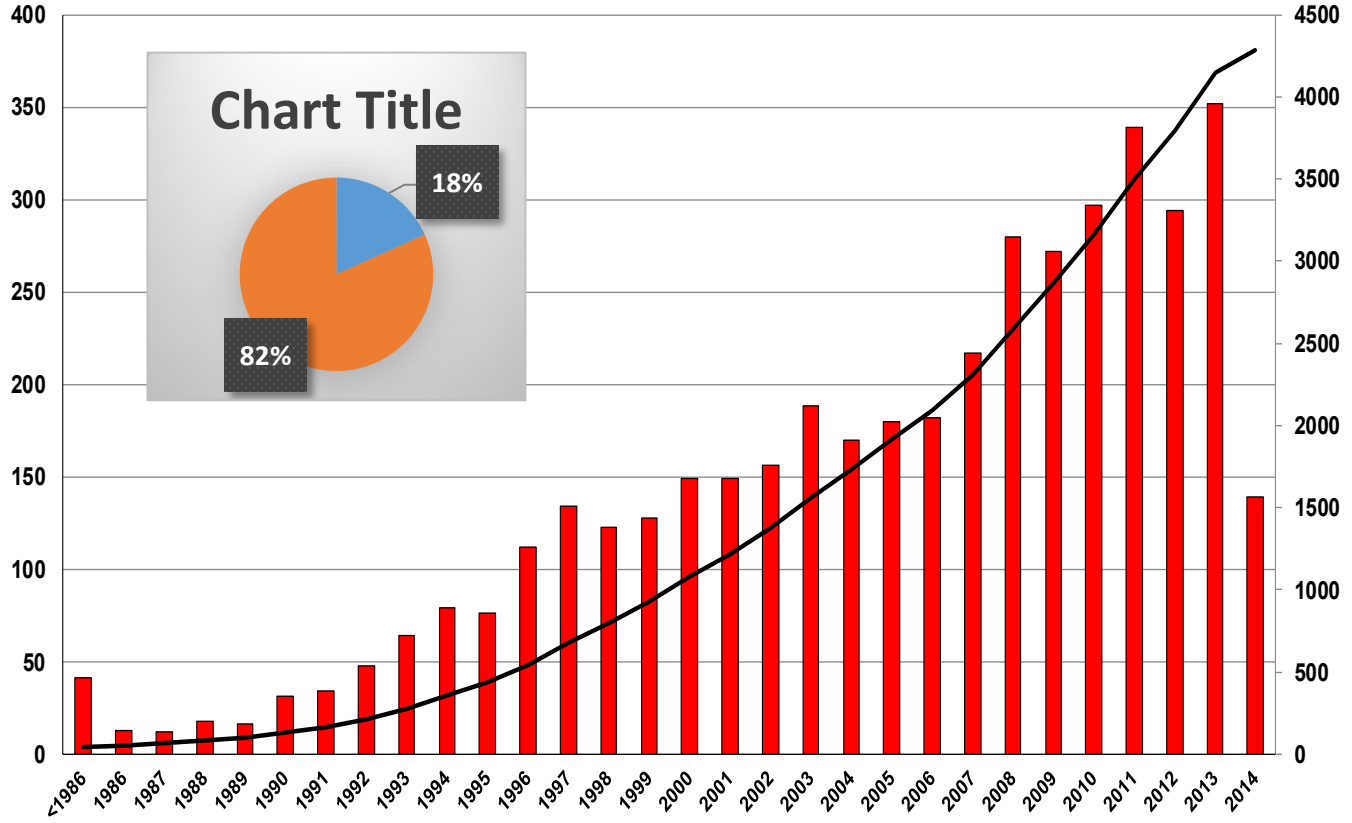
[4]National Clinical Research Center for Oral

efficacy or performance in each study were registered and assigned to different

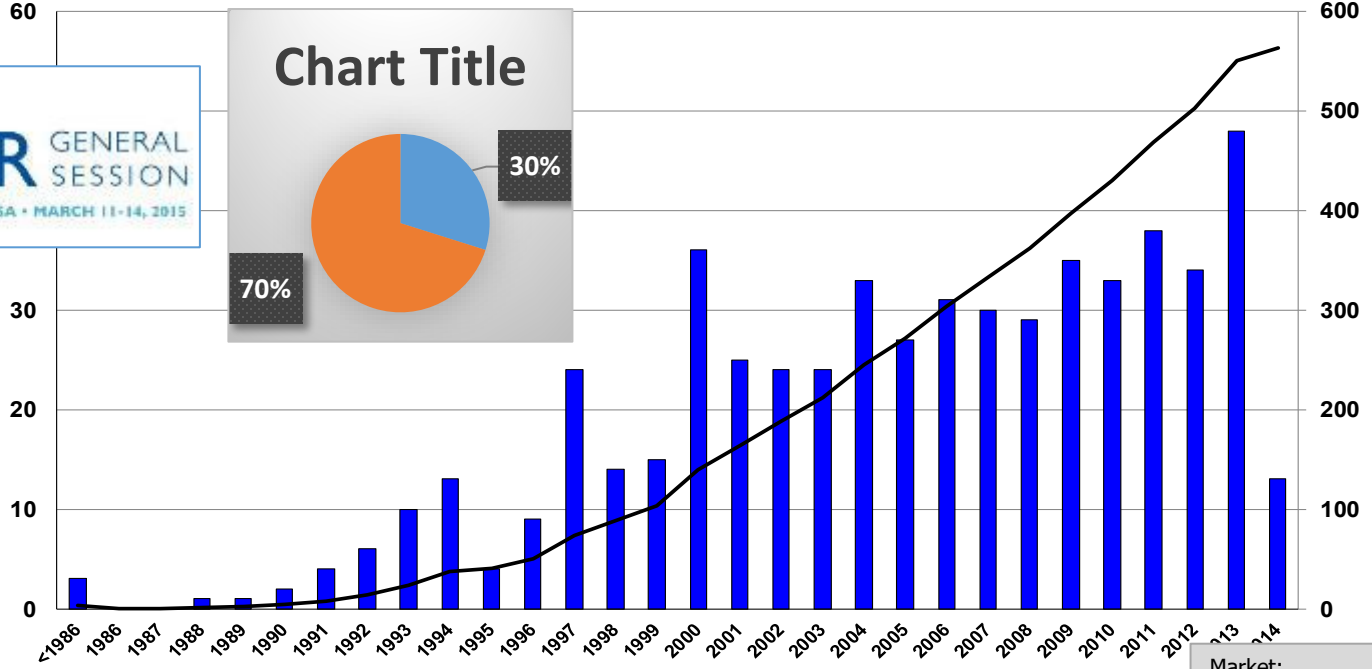
Questions

1. How many manufacturers and brands?
2. How many published clinical studies can be labelled as scientific?
3. How many manufacturers and brands have been documented in scientific clinical studies?

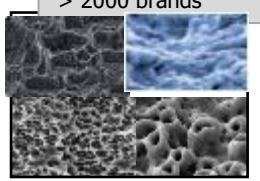
Publications reporting data from clinical studies on dental implants (n=4309)



Publications on clinical studies on dental implants, with focus on effects of implant design factors (n=566)

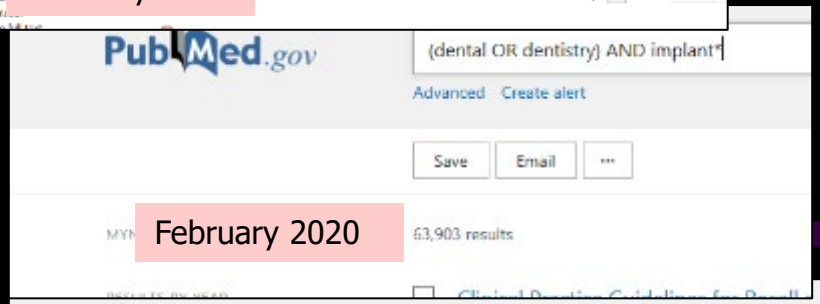


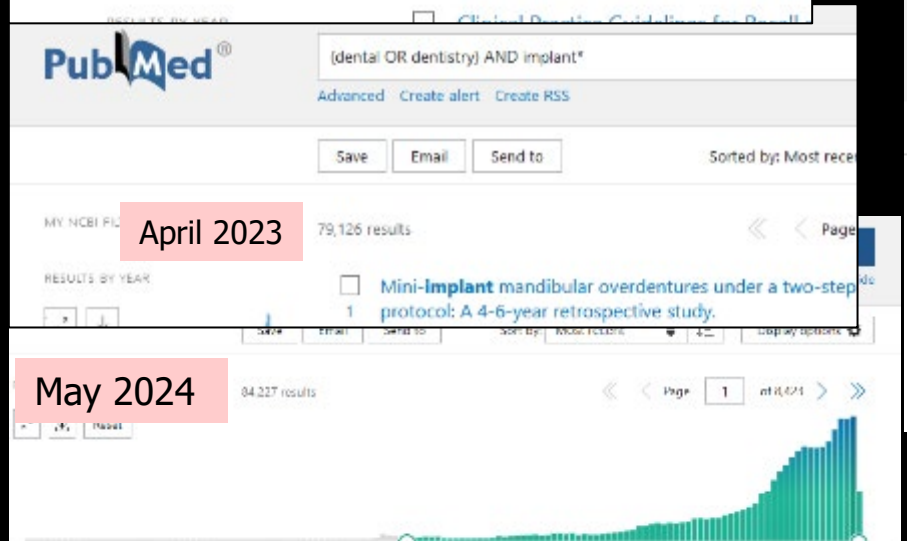
Market:
390 manufacturers
> 2000 brands



Pubmed

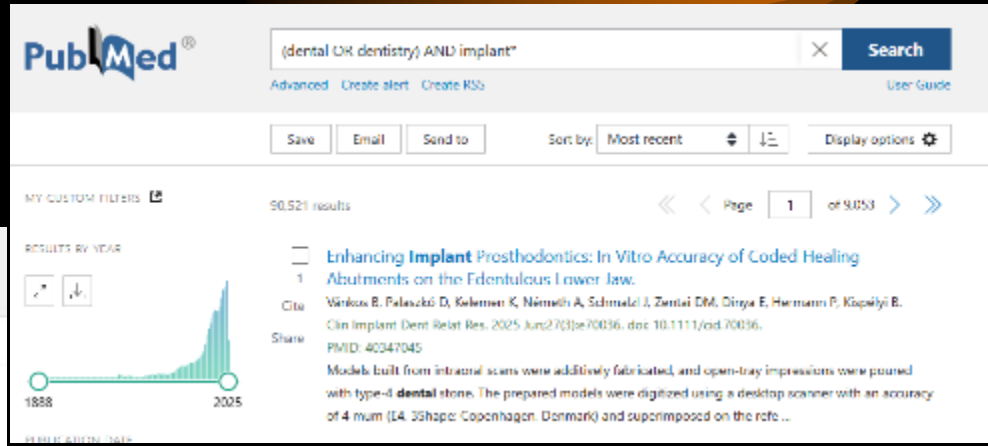
(dental OR dentistry) AND implant*

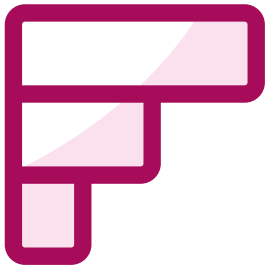




Scientific publications

February 2015:	48824		
February 2020:	63903	~3k /yr.	~58 /week
April 2023:	79126	~5k /yr.	~96 / week
May 2024:	84227	~5k /yr.	
May 2025:	90521	~6k /yr.	~115 / week





Rank the manufacturers based on the number of scientific clinical studies conducted on their implants

Reported manufacturers in ~8300 clinical studies:

Top ten manufacturers

1.	2757	Nobel Biocare	(USA)
2.	1811	Straumann	(Switzerland)
3.	1575	Dentsply Sirona	(USA)
4.	590	3i	(USA)
5.	555	Zimvie	(USA)
6.	424	BioHorizons Camlog	(USA)
7.	163	Sweden & Martina	(Italy)
8.	115	MIS	(Israel)
9.	108	Neodent	(Brazil)
10.	92	Dentium	(Korea)

Manufacturers studied ~8300 clinical studies:

≥ 20 clinical studies

83	Osstem
81	Thommen
78	MegaGen
76	BICON
72	Southern
43	BTI
38	3M ESPE / IMTEC
33	Neoss
33	Impladent

32	Innova (Endopore)
32	Conexao
31	Neobiotec
31	JDental Care
31	BEGO
28 -	Dentaurum
25	Mozo-Grau
25	ADIN
23	Klockner

<20 – 5
~50 producers

< 5
~150 producers

None
~500 producers

Practical difficulties in estimating precise numbers

Examples of acquired and merged companies, name changes, etc.

1. 2757 Nobel Biocare acquired Steri-Oss
2. 1811 Strauman acquired multiple companies
3. 830 Dentsply Sirona acquired Astra Tech
4. 745 Dentsply Sirona acquired Ankylos / Frialit / IMZ / XiVe (Friadent)
5. 590 3i / Biomet 3i / Zimmer Biomet (merge) → 3i
6. 555 Zimvie (namechange) acquired: Core-Vent / Paragon / Sulzer
7. 424 BioHorizons acquired Keystone / Lifecore & Camlog / Altatec
8. 163 Sweden & Martina
9. 115 MIS (separate entity, Dentsply Sirona owned)
10. 108 Neodent (separate entity, Straumann owned)

1978 Biotes

1979 Brånemark standard (turned surface)

1984 Brånemark Conical (turned)

1986 Brånemark Ebon (turned)

1990 Brånemark self-tapping - (turned)

1994 Brånemark Mk II self-tapping - (turned)

1996 Brånemark Mk III - (turned)

1997 Replace +/- HA

1998 Replace Select Tapered

1998 Replace Select Straight

1999 Brånemark Mk IV - (turned)

1999 Brånemark NOVUM

2000 Tiunite (anodic oxidate) surface

2000 NobelSpeedy

2003 NobelPerfect

2005 "Groovy" implant

2004 NobelDirect

2005 "Shorty" implant

2005 NobelReplace ← Replace Select

2008 NobelActive

2012 Ziunite

2015 NobelParallel CC (conical connection)

2021 N1

Major implant company # 1

Nobel Biocare™

Major implant company # 2

Acquisitions

Anthogyr S.A. -->2016-2019

Equinox --> 2016

Maxon Dental Gmbh -->2016-2017

MEDENTIKA --> 2013-2019

NEODENT. --> 2012-2015

T-Plus Implant --> 2015-2018

WARANTEC Com. →2017 (distribution)

Zinedent ---> 2019

Major implant company # 3 & 4

Acquisitions:

2003

Friadent, Germany

1979 IMZ (Friedrichsfeld (USA: Interpore)

→ Friatec Dental (name changed to Friadent)

1988 Steri-Oss/Core-Vent distribution USA

1992 Frialit-2 / Frios (1999 in USA)

1993 Ankylos

2003 Dentsply acquire Friadent → name change to Dentsply Friadent

2008 Ankylos C/X

2012 Merge with Dentsply Implants

2012

Astra Tech, Sweden

1985 Cylinder

1989 Tioblast surface

1991 Microthread design

2004 Osseospeed

2008 Ossespeed TX 3.0S

2010 Ossespeed TX

2011 Osseospeed TX Profile

2012 Astra Tech Implant EV

2014 Osseospeed Profile EV

Major implant company # 5 & 6

3i Implantnovations, Inc. (1987–1999)

- Osseotite® surface implants — 1995.

Biomet 3i (1999–24 Jun 2015)

- Certain internal-connection (Osseotite Certain®) — 2004.
- NanoTite (NanoTite PREVAIL implant) — 2007.
- Osseotite 2 Parallel-Walled implant — 2011.
- 3i T3 implant — 2013.

Zimmer Biomet (24 Jun 2015–1 Mar 2022)

- 3i T3 Short implants — 2015 (EU/AU) and 2016 (U.S.).

ZimVie (from 1 Mar 2022)

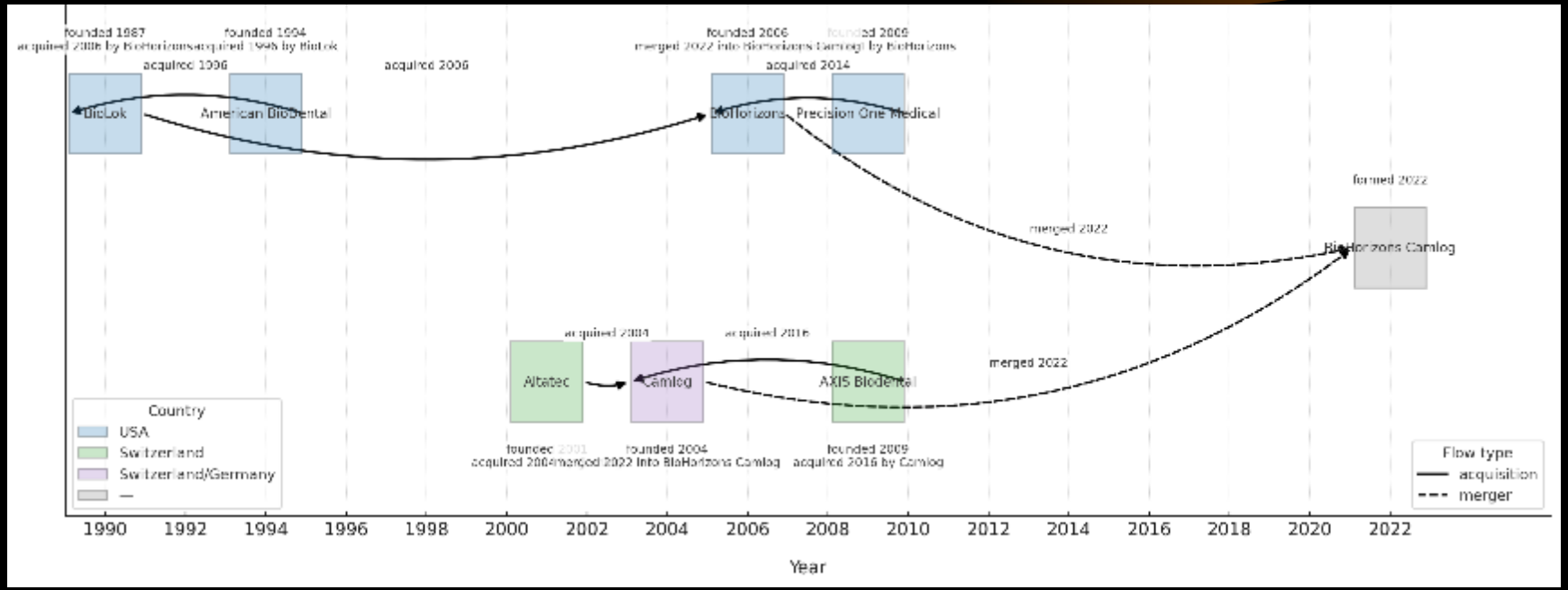
- T3 PRO Tapered implant — 2022.

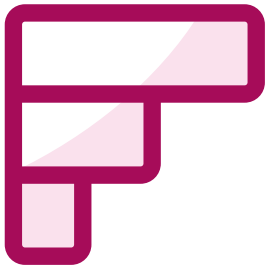
Company	Founded	Acquired
BioLok (USA)	1987	By BioHorizons 2006
American BioDental Corp (USA)	1994	by BioLok 1996
Altatec (Switzerland)	2001	by Camlog 2004
Medentis (Germany)	2001	by Henry Schein 2018
Intra-Lock Systems (USA)	2002	by Henry Schein 2018
Camlog (Switzerland/Germany)	2004	by Henry Schein 2012
BioHorizons (USA)	2006	by H.Schein 2013-2018
S.I.N. (Brazil)	2006	by Henry Schein 2021
AXIS Biodental (Switzerland)	2009	by Camlog 2016
Precision One Medical (USA)	2009	By BioHorizons 2014
Implantcopies (Germany)	2012	by Medentis 2012
BioHorizons Camlog (Intern.)	2022	Merge

Major implant company # 7

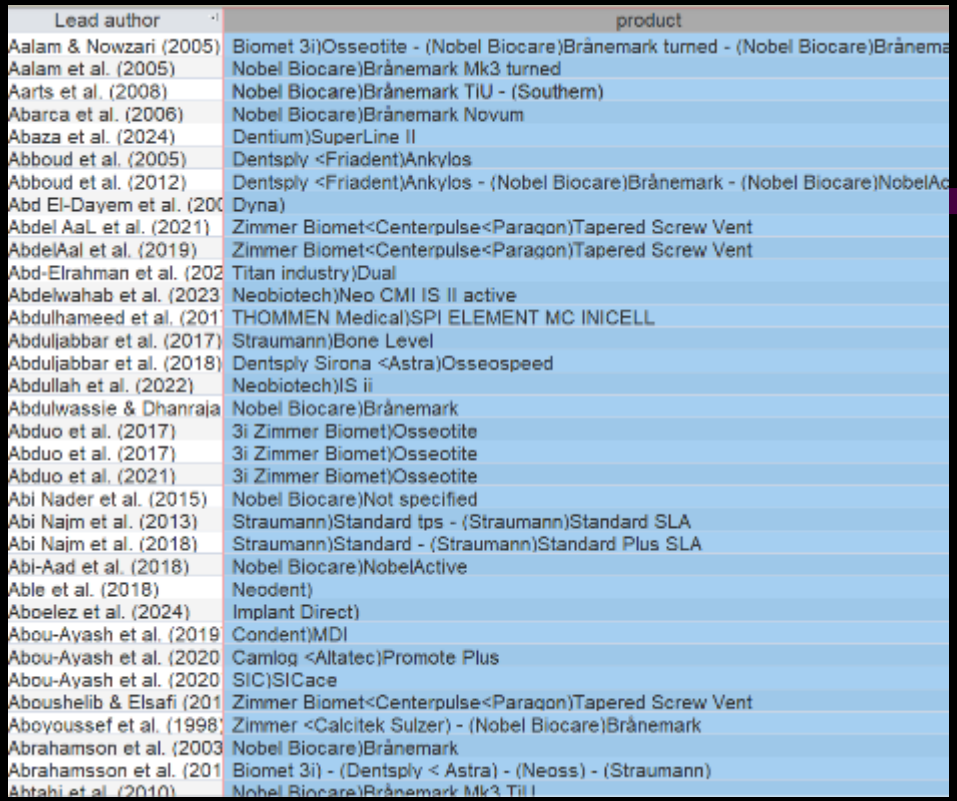
biohorizons camlog

(Henry Schein (USA)

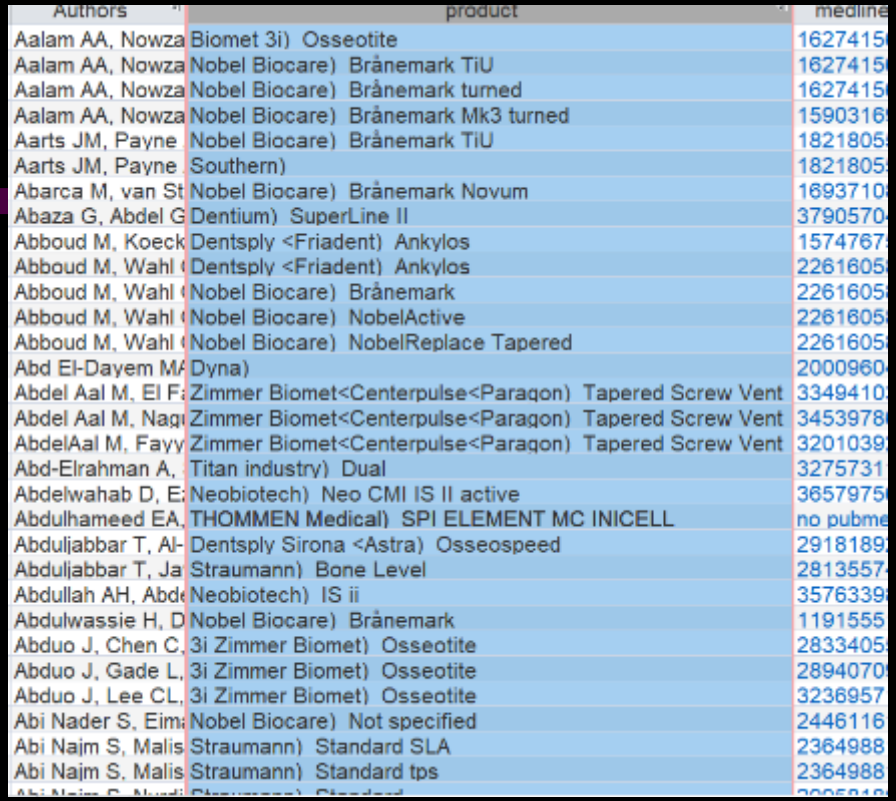




Which implant has been studied the most in scientific clinical research?



Lead author	product
Aalam & Nowzari (2005)	Biomet 3i)Osseotite - (Nobel Biocare)Brånemark turned - (Nobel Biocare)Brånema
Aalam et al. (2005)	Nobel Biocare)Brånemark Mk3 turned
Aarts et al. (2008)	Nobel Biocare)Brånemark TiU - (Southern)
Abarca et al. (2006)	Nobel Biocare)Brånemark Novum
Abaza et al. (2024)	Dentium)SuperLine II
Abboud et al. (2005)	Dentsply <Friadent)Ankylos
Abboud et al. (2012)	Dentsply <Friadent)Ankylos - (Nobel Biocare)Brånemark - (Nobel Biocare)NobelAc
Abd El-Dayem et al. (200	Dyna)
Abdel AaL et al. (2021)	Zimmer Biomet<Centerpulse<Paragon)Tapered Screw Vent
AbdelAal et al. (2019)	Zimmer Biomet<Centerpulse<Paragon)Tapered Screw Vent
Abd-Elrahman et al. (202	Titan industry)Dual
Abdelwahab et al. (2023	Neobiotech)Neo CMI IS II active
Abdulhameed et al. (201	THOMMEN Medical)SPI ELEMENT MC INICELL
Abduljabbar et al. (2017)	Straumann)Bone Level
Abduljabbar et al. (2018)	Dentsply Sirona <Astra)Osseospeed
Abdullah et al. (2022)	Neobiotech)IS ii
Abdulwassie & Dhanraja	Nobel Biocare)Brånemark
Abduo et al. (2017)	3i Zimmer Biomet)Osseotite
Abduo et al. (2017)	3i Zimmer Biomet)Osseotite
Abduo et al. (2021)	3i Zimmer Biomet)Osseotite
Abi Nader et al. (2015)	Nobel Biocare)Not specified
Abi Najm et al. (2013)	Straumann)Standard tps - (Straumann)Standard SLA
Abi Najm et al. (2018)	Straumann)Standard - (Straumann)Standard Plus SLA
Abi-Aad et al. (2018)	Nobel Biocare)NobelActive
Able et al. (2018)	Neodent)
Aboelez et al. (2024)	Implant Direct)
Abou-Ayash et al. (2019	Condent)MDI
Abou-Ayash et al. (2020	Camlog <Altatec)Promote Plus
Abou-Ayash et al. (2020	SIC)SICace
Aboushelib & Elsafi (201	Zimmer Biomet<Centerpulse<Paragon)Tapered Screw Vent
Aboyoussef et al. (1998)	Zimmer <Calcitek Sulzer) - (Nobel Biocare)Brånemark
Abrahamson et al. (2003	Nobel Biocare)Brånemark
Abrahamsson et al. (201	Biomet 3i) - (Dentsply < Astra) - (Neoss) - (Straumann)
Abtahi et al. (2010)	Nobel Biocare)Brånemark Mk3 TiU



Authors	product	medline
Aalam AA, Nowza	Biomet 3i) Osseotite	1627415
Aalam AA, Nowza	Nobel Biocare) Brånemark TiU	1627415
Aalam AA, Nowza	Nobel Biocare) Brånemark turned	1627415
Aalam AA, Nowza	Nobel Biocare) Brånemark Mk3 turned	1590316
Aarts JM, Payne	Nobel Biocare) Brånemark TiU	1821805
Aarts JM, Payne	Southern)	1821805
Abarca M, van St	Nobel Biocare) Brånemark Novum	1693710
Abaza G, Abdel G	Dentium) SuperLine II	3790570
Abboud M, Koeck	Dentsply <Friadent) Ankylos	1574767
Abboud M, Wahl (	Dentsply <Friadent) Ankylos	2261605
Abboud M, Wahl (	Nobel Biocare) Brånemark	2261605
Abboud M, Wahl (	Nobel Biocare) NobelActive	2261605
Abboud M, Wahl (	Nobel Biocare) NobelReplace Tapered	2261605
Abd El-Dayem MA	Dyna)	2000960
Abdel Aal M, El Fa	Zimmer Biomet<Centerpulse<Paragon) Tapered Screw Vent	3349410
Abdel Aal M, Nagu	Zimmer Biomet<Centerpulse<Paragon) Tapered Screw Vent	3453978
AbdelAal M, Fayy	Zimmer Biomet<Centerpulse<Paragon) Tapered Screw Vent	3201039
Abd-Elrahman A,	Titan industry) Dual	3275731
Abdelwahab D, E	Neobiotech) Neo CMI IS II active	3657975
Abdulhameed EA,	THOMMEN Medical) SPI ELEMENT MC INICELL	no pubme
Abduljabbar T, Al-	Dentsply Sirona <Astra) Osseospeed	2918189
Abduljabbar T, Ja	Straumann) Bone Level	2813557
Abdullah AH, Abde	Neobiotech) IS ii	3576339
Abdulwassie H, D	Nobel Biocare) Brånemark	1191555
Abduo J, Chen C,	3i Zimmer Biomet) Osseotite	2833405
Abduo J, Gade L,	3i Zimmer Biomet) Osseotite	2894070
Abduo J, Lee CL,	3i Zimmer Biomet) Osseotite	3236957
Abi Nader S, Eim	Nobel Biocare) Not specified	2446116
Abi Najm S, Malis	Straumann) Standard SLA	2364988
Abi Najm S, Malis	Straumann) Standard tps	2364988

~10.000 implant brands specified in ~8400 clinical studies

Effects of dental implant design features on outcomes?

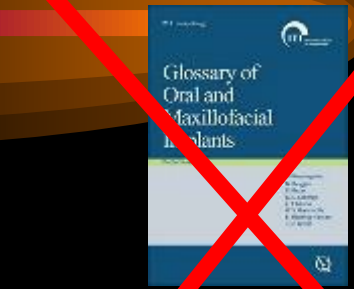
CLAIM: *Tapered implants are superior!*

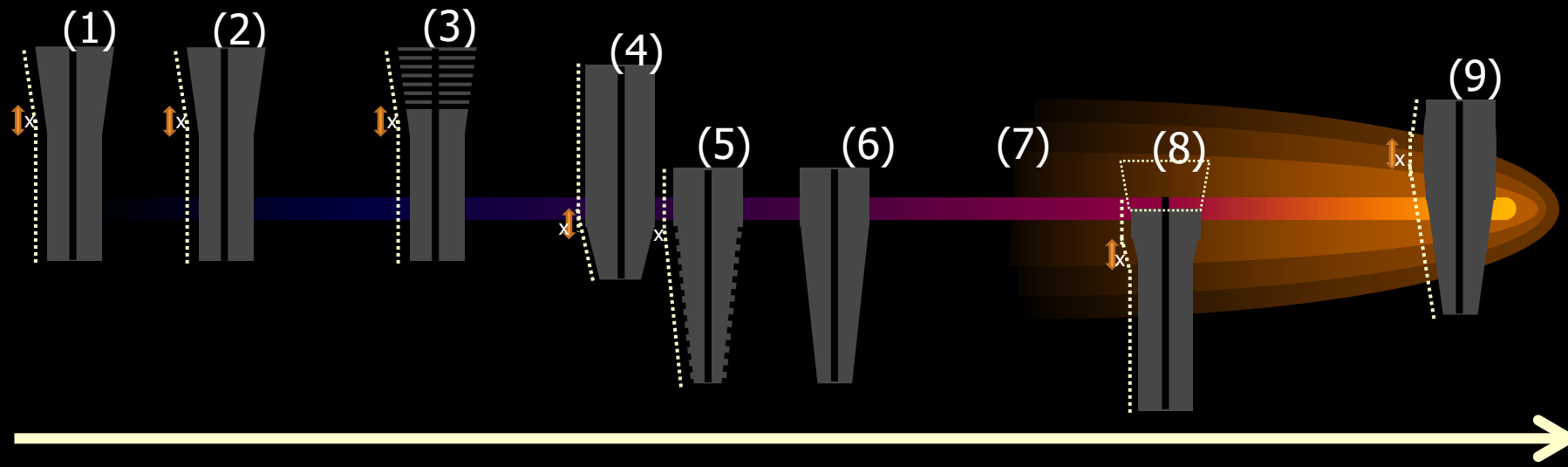
..eeh – what is a «tapered» implant?

1st problem: when does an implant have a tapered form?

General form

- Straight
- Tapered
- Conical
- Ovoid
- Trapezoidal
- Stepped
- Combinations

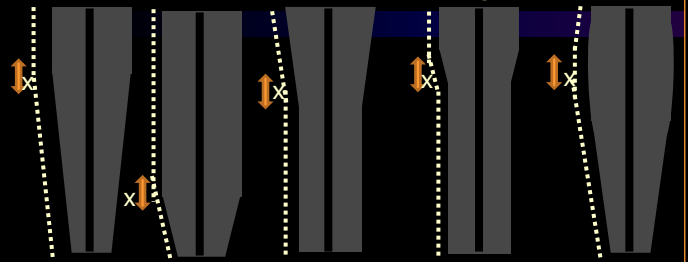


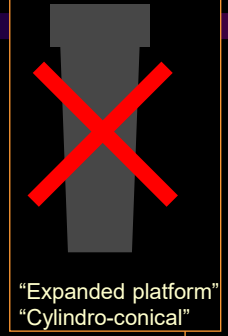


1986	1988 2004	1990 2006	1992 2008	1992	1996	1998	2000	2002
Branemark Conical (NobelPharma (1) Kahnberg1989	Type F (Submerged) (Straumann) Asikainen&Sutter 1990 PACE (CAL-Form) Coatam 1997	Fixture ST (Astra) Norton 1998	(4) mini (Steri-oss) Jung 1996	Endopore (Innova) (5) Deporter 1996	Replace (Steri-Oss) Callan 2000 intro 1997	3i NT (3i) (6) Ibanez 2002	ITI TE Straumann(7) Sultzer 2004	NobelActive NobelBiocare(8) Kielbasa 2009

1st problem: when does an implant have a tapered form?

Variations of tapering and examples





"Expanded platform"
"Cylindro-conical"

Straumann Bone Level Tapered (BLT)

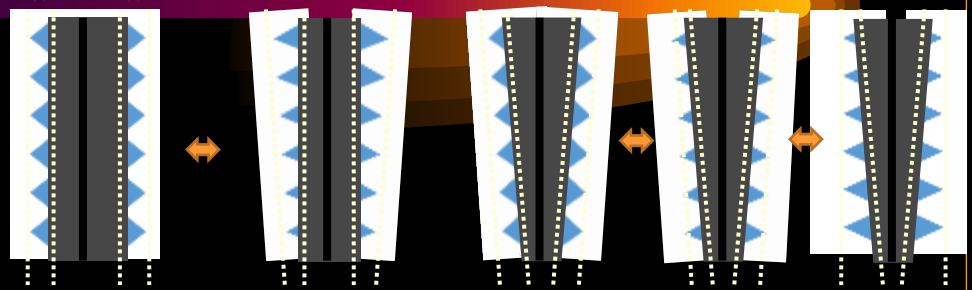
Brånemark Mk4

Astra Osseospeed

Straumann Tapered Effect (TE)

NobelActive

Body Core is cylindrical
Body Core is Tapered
Radius of the threads relative to radius of core
Equidistant
Decrease apically
Equidistant
increase apically



(dotted lines are added for visual aid):

"Reverse conical neck"
e.g. Alpha -Bio SFB

Osteofix

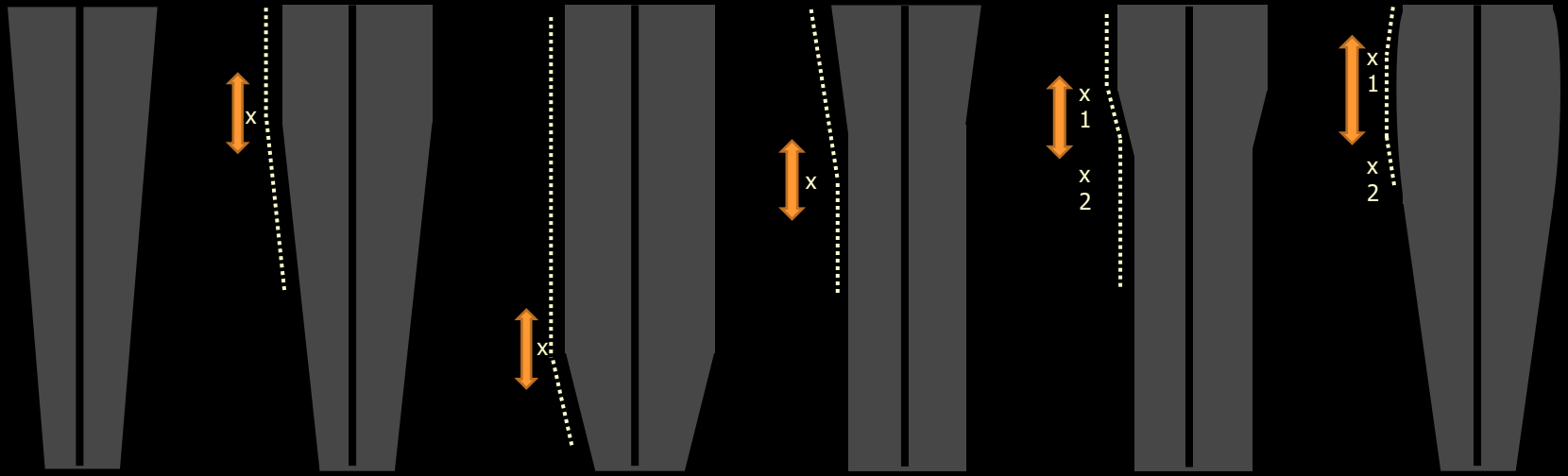
Tatum D ("Fin-implant")

MIS Seven

1st problem: when does an implant have a tapered form?

Definition: A tapered implant is recognized as a *cylindrical implant where the endosseous part narrows in diameter toward the apex.*

- This definition encompasses all implants where the taper is located in the cervical, middle or apical parts only, as well as implants that taper continuously from the cervical platform to the apex



CONSENSUS REPORT

WILEY

Group 1 ITI Consensus Report: The influence of implant length and design and medications on clinical and patient-reported outcomes

Ronald E. Jung[1] | Bilal Al-Nawas[2] | Mauricio Araujo[3] | Gustavo Avila-Ortiz[4] | Stephen Barter[5] | Nadine Brodala[6] | Vivianne Chappuis[7] | Bo Chen[8] | Andre De Souza[9] | Ricardo Faria Almeida[10,11] | Stefan Fickl[12] | Gary Finelle[13] | Jeffrey Ganeles[14,15] | Hadi Gholami[9] | Christoph Hammerle[1] | Simon Jensen[16] | Asbjørn Jokstad[17,18] | Hideaki Katsuyama[19,20] | Johannes Kleinheinz[21] | Chatchai Kunavisarut[22] | Nikos Mardas[23] | Alberto Monje[7,24] | Panos Papaspyridakos[9] | Michael Payer[25] | Eik Schiegnitz[2] | Ralf Smeets[26] | Martina Stefanini[27] | Christiaan ten Bruggenkate[28] | Konstantinos Vazouras[9] | Hans-Peter Weber[9] | Dieter Weingart[29] | Péter Windisch[30]

[1]Clinic of Fixed and Removable Prosthodontics and Dental Material Science, University of Zurich, Zurich, Switzerland
[2]Department of Oral and Maxillofacial Surgery, Plastic Surgery, University Medical Center of the Johannes Gutenberg University Mainz, Mainz, Germany
[3]Department of Dentistry, Universidade Estadual de Maringa, Maringa, Brazil
[4]Department of Periodontics, University of Iowa College of Dentistry, Iowa City, Iowa
[5]Centre for Oral Clinical Research, Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, UK
[6]Private Practice, Chicago, Illinois
[7]Department of Oral Surgery and Stomatology, University of Bern, Bern, Switzerland

FIGURE 1 Different types of configurations and geometrie for tapered implants available on the dental market

Systematic review of clinical and patient-reported outcomes following oral rehabilitation on dental implants with a tapered compared to a non-tapered implant design

Asbjørn Jokstad[1] | Jeffrey Ganeles[2,3]

[1]Faculty of Health Sciences, UiT The Arctic University of Norway, Tromsø, Norway
[2]South Florida Center for Periodontics & Implant Dentistry, Boca Raton, FL, USA
[3]Nova Southeastern University College of Dental Medicine, Ft. Lauderdale, FL, USA

Correspondence
Asbjørn Jokstad, Department of Clinical Dentistry, Faculty of Health Sciences, UiT The Arctic University of Norway, Tromsø, Norway
Email: asbjorn.jokstad@uit.no

Abstract

Background: Dental implants are available in different shapes.

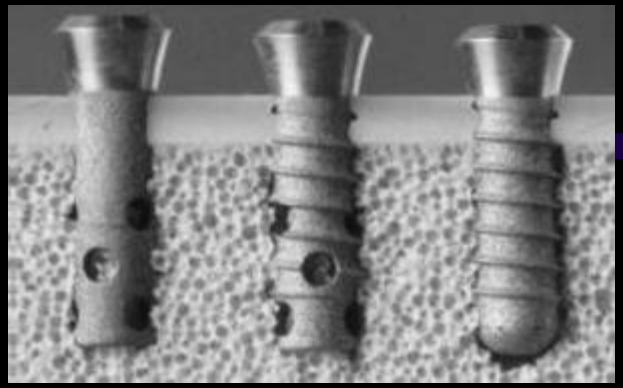
Aims: This systematic review aims to address whether tapered compared to non-tapered implants demonstrate similar clinical and patient-reported outcomes. The review follows the preferred reporting items for systematic reviews and meta-analyses (PRISMA) format.

Materials & Methods: We searched electronic databases including MEDLINE through PubMed and the Cochrane Central Register of Controlled Trials for randomized clinical trials (RCT) that compare tapered versus non-tapered implants with at least 10 treated participants and a minimum mean follow-up time of 3 years. There were no restrictions to a particular treatment indication or outcome measures. Two authors independently conducted screening, risk of bias assessment, and data extraction of eligible trials in

No, no - WAIT!: The abutment connection more important!

Implant design evolution, e.g. Straumann

ITI Bonefit® System (Intro 1986) ø3.5mm



Hollow Cylinder *(disc. 1992)*

Hollow Screw *(disc. 1992)*

Solid Screw

ø3.3 mm (1996)

Standard Regular neck | **Standard Regular neck** | **Standard+ Regular neck** | **Standard Wide neck** | **Standard+ Narrow neck**

Octa (screw) (Intro 1992)

Octa solid (cement) (Intro 1994)

CrossFit

SynOcta: New octagon into the 8° Morse taper (Intro 1999)

Implant design evolution, e.g. Straumann

1986 Standard (Bonefit) ITI solid screw (tps)

2001 / 2002 S. Plus (Standard plus) TE (ITI Esthetic Plus)

2007 BL

2015 BLT

2019 BLX

2021 TLX

2025 iEXCEL

CrossFit® connection

----TorcFit® connection----

Octa connection ←2000

2000→synOcta connection

Digital solutions
Digital workflow

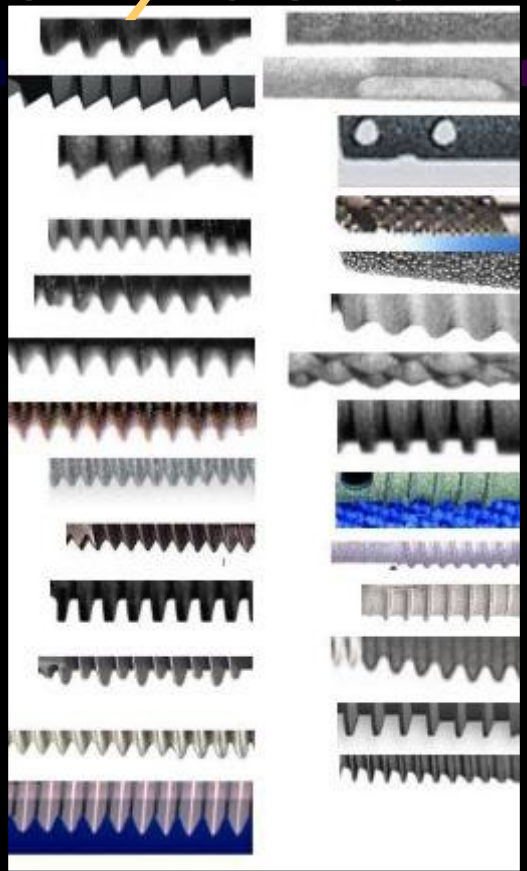
Consider not only the implant design, but also the implant:abutment connection

Effects of other implant design details are poorly documented scientifcally 1/3

Flange

- **Flange vs. no flange**
- **Straight vs. flared vs. widening**
- **Height**
- **Polished vs. threads**
- **Added features**
- **Surface topography**

Effects of other implant design details are poorly documented scientifcally 2/3



Threading

- Threads vs. non-threads
- Shape: V- vs. square- vs. reverse buttress- vs. combinations
- Number and size of “lead threads”
- Number and location of grooves, groove forms and groove sizes
- Surface micro-topography
- Thread angle

Effects of other implant design details are poorly documented scientifcally 2/3

Apex

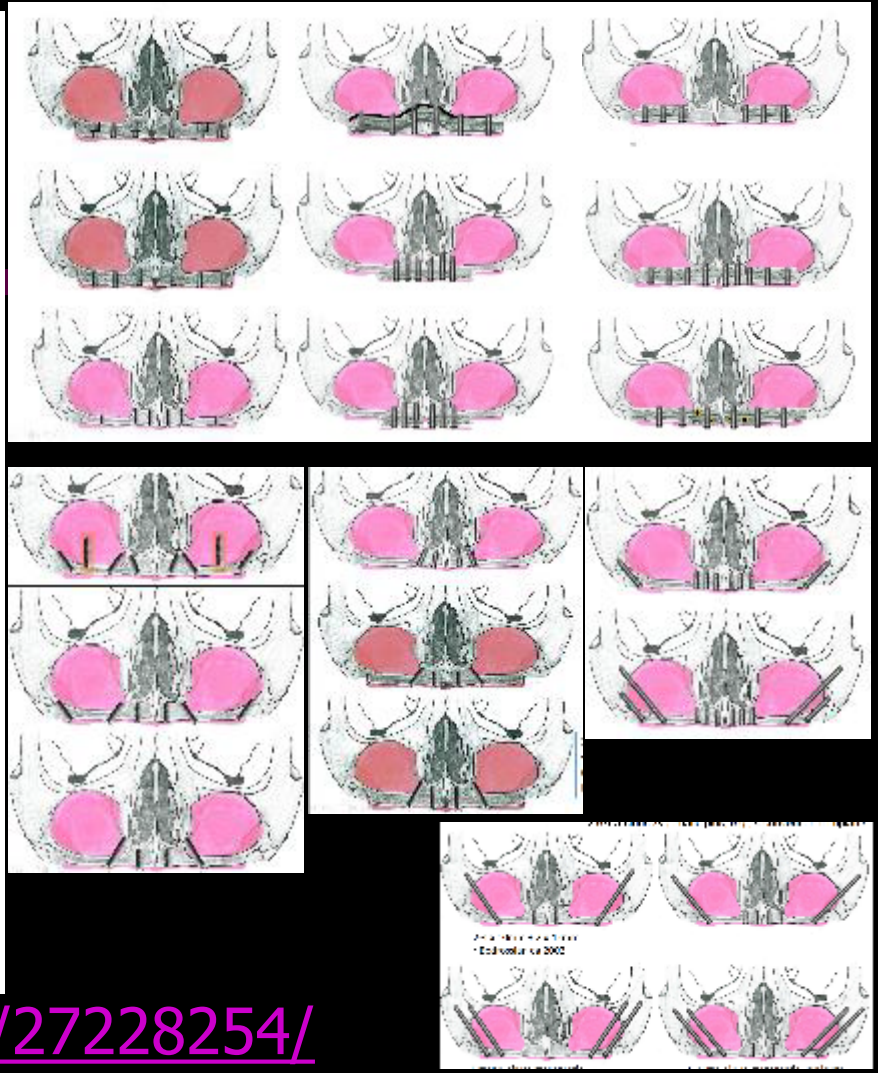
- Threaded vs non-threaded
- V-shape vs flat vs curved apex
- Holes, round, oblong
- Apical chamber
- Grooves and groove size
- Flared apex
- Surface topography

A Systematic Review of the Role of Implant Design in the Rehabilitation of the Edentulous Maxilla

Asbjørn Jokstad, DDS, PhD[1]/Mariano Sanz, DDS, PhD[2]/
Takahiro Ogawa, DDS, PhD[3]/Francesco Bassi, MD, DDS[4]/Liran Levin, DMD[5]/
Ann Wennerberg, DDS, PhD[6]/Georgios E. Romanos, DDS, PhD, DMD[7]

Purpose: *To identify and critically appraise scientific publications evaluating the possible effect of implant design on treatment outcomes in the rehabilitation of patients with a fully edentulous maxilla.* ***Materials and Methods****: Scientific reports were sought in three electronic bibliographic databases, combined with searches for meeting abstracts, and in the grey literature. English, German, or Scandinavian scientific publications on prospective or retrospective longitudinal studies with effects of an implant design or feature on the treatment outcomes were eligible. Minimum requirement for inclusion was at least 10 study participants who were followed up for at least 2 years after implant loading. The PRISMA guidelines were followed for selecting data to extract from the individual studies. These were characteristics of the individual studies, risk of bias within individual studies, and the results of individual studies. Three editorial teams independently identified and extracted the data.* ***Results:*** *The search resulted in 998 primary studies, of which 525 met the inclusion criteria and were read in full text. Of these, 105 studies were included in qualitative syntheses. Seventeen studies were designed with an objective to assess effects of implant design or feature on outcomes, 23 studies described tilted implants to enable placement of longer implants, 30 studies reported effects of implants placed in zygomatic bone with or without additional alveolar implants, and 9 studies reported effects of implants placed in pterygoid bone or other bony buttresses with or without additional alveolar implants. Sixteen articles reported bone augmentation with simultaneous or delayed implant placement in patients with a predominantly Cawood-Howell bone class V and VI maxilla. Ten papers reported effects of implant design on outcomes, despite the lack of an a priori stated objective to assess a particular implant design or feature. There is a lack of compelling data to state that one particular implant system or design feature stands out amidst others, when applied to restoring the fully edentulous maxilla with implant-retained prostheses.* ***Conclusion:*** *This systematic review failed to identify compelling evidence to conclude that any particular implant or feature affects the treatment outcome in patients with a fully edentulous maxilla.* Int J Oral Maxillofac Implants 2016;31(suppl):s43–s57. doi:10.11607/jomi.16suppl.g2

Keywords: *bibliographic, databases, humans, prospective studies, retrospective studies, treatment outcome, zygoma*



https://pubmed.ncbi.nlm.nih.gov/27228254/

Nine considerations for the practicing dentist:

1. Is the manufacturer represented locally and can be **consulted easily**?
2. **Can they deliver** required products timely and reliably in extraordinary situations?
3. The manufacturer's **ethical and professional reputation**. Is the manufacturer's promotion exact, fair and comprehensive?

Nine considerations for the practicing dentist:

4. Does the manufacturer provide **service** and **training possibilities**?
5. **Ease of use.** Are the training requirements for using the implant system intricate?
6. **Flexibility of applications.** ? alternative prosthodontic options such as o-rings, attachments and choice of screw retained or cemented supraconstructions, possibility for cast and cemented abutments, angled abutments and anti-

Nine considerations for the practicing dentist:

7. Stock inventory. Is it necessary for the dentist to acquire an extensive supply of hardware to meet different treatment situations and thereby induce high inventory costs?

8. Engineering design. Since mechanical defects will occur sooner or later, are elaborate and/or time-consuming techniques necessary in order to make adjustments or remakes?

Nine considerations for the practicing dentist:

9. Costs

- Surgical and prosthetic start-up kit,
- Per implant and per component,
- Course/training costs
- Accumulated time required for adjustments and mechanical failures
- Involves patient trust and opportunity cost.

Undergraduate UofOslo, FofD
1974-1979

Military dentist contracted
1979-1982

Private & public dental clinics
FofD, clinic demonstrator
Information technology studies, UofO
Postgraduate biology studies, FodD
1982-1984

FofD Oral anatomy SEM & TEM +
FoD I.T. infrastructure & teaching
+
Nordic Institute of Dental Materials
Clinical trials program - PBRN
Toxicology studies, UofO (Hg:amalgam)
1984-1992

Private practice (1982-2005)
1992 - 1994 Specialty training prosthodontics

(Digital) Oral prosthetics & function (1994-1998)

Cariologi (1998-2004)
Professor 2001

Oral prosthetics & function
Professor (2004-2005)

Science Commission
1999-2005
Scientific Affairs Manager
2002-2006
2005

1991/1992 PhD – Clinical data = Complex multivariate, multivariable statistics

Critical lack of understanding statistics and clinical research methodology in dentistry!!!

1996

1995

FofD Postgraduate teaching
(1992-2004)
Biostatistics
Research methodology

Clinical epidemiology & Evidence-Based health Care

2013

norsk pasientskade-erstatning

European Innovation Council

THE ARCTIC UNIVERSITY OF NORWAY • UIT •

ITI

Clinical and Experimental Dental Research
WILEY